Appl. No. 10/574,592 <u>PATENT</u>
Attorney Docket No.: 57.0534 US PCT

## **Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application.

## **Listing of Claims:**

## 1–54 (Cancelled)

55. (New) A method of treating a subterranean formation by providing a wellbore fluid which comprises:

an anionic surfactant for forming a viscoelastic (VES) gel in which the surfactant is a solution of worm-like micelles, the surfactant being selected from:

- a carboxylate containing a hydrophobic group of 18 to 22 carbon atoms;
- a compound of formula R-X-Y-Z, in which R is the hydrophobic tail of the surfactant, Z is the hydrophilic head of the surfactant and is either COO<sup>-</sup> or SO<sub>3</sub><sup>-</sup>, X is an amide or ester group and Y is a linear or branched, saturated or unsaturated chain of 1, 2 or 3 carbon atoms;
- a dimer, trimer or oligomer of a said carboxylate or said compound of formula R-X-Y-Z;

a viscosity-enhancing nonionic hydrophilic-lipophilic organic compound having one or more polar groups, wherein the molar ratio of the organic compound to the anionic surfactant is not greater than 0.5; and

a salt at a concentration in a range of 0 to less than 6 wt%; and injecting the fluid into a wellbore leading to the subterranean formation.

56. (New) The method of claim 55 wherein the anionic surfactant has a hydrophobic group selected from one or more of oleyl, linoleyl, erucyl and tallowyl.

Appl. No. 10/574,592 <u>PATENT</u>

Attorney Docket No.: 57.0534 US PCT

57. (New) The method of claim 55 wherein the anionic surfactant is selected from ester succinates, amide succinates and sarcosinates.

- 58. (New) The method of claim 55, wherein the hydrophilic-lipophilic organic compound is non-ionic and is composed of a linear or branched saturated or partially unsaturated carbon chain comprising one or more –OH or –NH<sub>2</sub> polar groups.
- 59. (New) The method of claim 58, wherein the hydrophilic-lipophilic compound contains at least one other group selected from an ether, ketone, amide, ester, phosphate ester or phosphonate ester group.
- 60. (New) The method of claim 55, wherein the hydrophilic-lipophilic organic compound is a mono-alcohol, a diol, an ethoxylated alcohol, ethoxylated amine, alkanolamide or fatty acid ethoxylate.
- 61. (New) The method of claim 55, wherein the hydrophilic-lipophilic organic compound is octan-1-ol, oleyl alcohol, versatyl alcohol, oleyl amine or a dimeric oleyl amine.
- 62. (New) The method of claim 55, wherein the molar ratio of the hydrophilic-lipophilic organic compound to the anionic surfactant is in a range from 0.01 to 0.4.
- 63. (New) The method of claim 55, wherein the molar ratio of the hydrophilic-lipophilic organic compound to the anionic surfactant is in a range from 0.05 to 0.3.
- 64. (New) The method of claim 55, wherein the wellbore fluid is a fracturing fluid or a diverting fluid.
- 65. (New) The method of claim 55 wherein the wellbore fluid has a salt concentration of less than 4 wt%.

Appl. No. 10/574,592 <u>PATENT</u>
Attorney Docket No.: 57.0534 US PCT

66. (New) The method of claim 55 wherein the wellbore fluid has a salt concentration of less than 3 wt%.

- 67. (New) The method of claim 55 wherein the viscosity of the wellbore fluid is above 60cp at  $100s^{-1}$  at a temperature of above 60°C.
- 68. (New) A method for increasing the temperature at which there is a decrease in viscosity of a wellbore treatment fluid comprising a surfactant for forming a viscoelastic (VES) gel decreases in which the surfactant is a solution of worm-like micelles, the surfactant being selected from:
  - a carboxylate containing a hydrophobic group of 18 to 22 carbon atoms;
  - a compound of formula R-X-Y-Z, in which R is the hydrophobic tail of the surfactant, Z is the hydrophilic head of the surfactant and is either COO<sup>-</sup> or SO<sub>3</sub><sup>-</sup>, X is an amide or ester group and Y is a linear or branched saturated or unsaturated chain of 1, 2 or 3 carbon atoms;
  - a dimer, trimer or oligomer of a said carboxylate or compound of formula R-X-Y-Z;

and wherein the fluid further comprises a salt at a concentration in a range of 0 to less than 6 wt%;

the method comprising adding to the treatment fluid a viscosity-enhancing amount of a non-ionic hydrophilic-lipophilic organic compound which is miscible with the fluid and has one or more polar groups.

- 69. (New) The method of claim 68 wherein the surfactant has a hydrophobic group selected from one or more of oleyl, linoleyl, erucyl and tallowyl.
- 70. (New) The method of claim 68, wherein the hydrophilic-lipophilic organic compound is composed of a linear or branched saturated or partially unsaturated carbon chain comprising one or more –OH or –NH<sub>2</sub> polar groups.

Appl. No. 10/574,592 <u>PATENT</u>
Attorney Docket No.: 57.0534 US PCT

71. (New) A method of treating a subterranean formation by providing a wellbore fluid which comprises:

an anionic surfactant for forming a viscoelastic (VES) gel in which the surfactant is a solution of worm-like micelles, the surfactant being selected from:

- a carboxylate containing a hydrophobic group of 18 to 22 carbon atoms;
- a compound of formula R-X-Y-Z, in which R is the hydrophobic tail of the surfactant, Z is the hydrophilic head of the surfactant and is either COO<sup>-</sup> or SO<sub>3</sub><sup>-</sup>, X is an amide or ester group and Y is a linear or branched saturated or unsaturated chain of 1, 2 or 3 carbon atoms;
- a dimer, trimer or oligomer of a said carboxylate or compound of formula R-X-Y-Z;

a salt at a concentration in a range of 0 to less than 6 wt%; and a nonionic hydrophilic-lipophilic organic compound having one or more polar groups, effective to raise the viscosity of the fluid at temperatures in a range from 50 to 100°C; and

injecting the fluid into a wellbore leading to the subterranean formation.

- 72. (New) The method of claim 71 wherein the anionic surfactant has a hydrophobic group selected from one or more of oleyl, linoleyl, erucyl and tallowyl.
- 73. (New) The method of claim 71 wherein the anionic surfactant is selected from ester succinates, amide succinates and sarcosinates.
- 74. (New) The method of claim 71, wherein the hydrophilic-lipophilic organic compound is composed of a linear or branched saturated or partially unsaturated carbon chain comprising one or more –OH or –NH<sub>2</sub> polar groups.

Appl. No. 10/574,592 PATENT

Attorney Docket No.: 57.0534 US PCT

75. (New) The method of claim 74, wherein the hydrophilic-lipophilic compound contains at least one other group selected from an ether, ketone, amide, ester, phosphate ester or phosphonate ester group.

- 76. (New) The method of claim 71, wherein the hydrophilic-lipophilic organic compound is a mono-alcohol, a diol, an ethoxylated alcohol, ethoxylated amine, alkanolamide or fatty acid ethoxylate.
- 77. (New) The method of claim 71, wherein the hydrophilic-lipophilic organic compound is octan-1-ol, oleyl alcohol, versatyl alcohol, oleyl amine or a dimeric oleyl amine.
- 78. (New) The method of claim 71, wherein the wellbore fluid is a fracturing fluid or a diverting fluid.
- 79. (New) The method of claim 71 wherein the wellbore fluid has a salt concentration of less than 4 wt%.
- 80. (New) The method of claim 71 wherein the wellbore fluid has a salt concentration of less than 3 wt%.
- 81. (New) The method of claim 71 wherein the wellbore fluid has viscosity above 60cp at  $100s^{-1}$  at temperatures in the range from 50 to 100°C.
- 82. (New) The method of claim 71 wherein the nonionic hydrophilic-lipophilic organic compound is effective to raise the viscosity of the fluid at temperatures in a range from 50 to 130°C.